

Attorney Docket 82887RLO
Customer No. 01333

REMARKS

Claims 1-10 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent 6,690,485 to Borrell et al in view of U.S. Patent No.5,633,662 to Allen et al. further in view of U.S. Patent No. 6,042,211 to Hudson et al.

The present invention, as set forth in Claim 1, relates to a method of modifying an input digital image wherein each input code values has a nonlinear relationship to colorant amount. One important application where this takes place is for multi-level printers. Applicants believe that they are the first to use this nonlinear relationship in controlling the amount of colorant that is deposited for a pixel. The advantages of the present invention are set forth on page 6 of the application.

Turning now to Borrell et al. At the outset, Applicants note that the Examiner concedes that Borrell et al do not disclose step (b) and step (c) in claim 1. However, Applicants believe that the Examiner has misinterpreted the Borrell et al. reference when he states that Borrell et al disclose the use of a code value having a nonlinear relationship to colorant amount in column 8, lines 43-51 and column 10, lines 16-31. The indicated paragraphs do not use the term nonlinear, nor is there any implication of such a nonlinear relationship. The only references to nonlinear relationships found in Borrell et al (e.g., FIG. 1; column 2, lines 40-45) relate to the well-known fact that there will be a nonlinear relationship between input code value and the resulting perceived intensity of the printed dot pattern. As set forth in claim 1, the present invention makes use of the nonlinear relationship between input code value and colorant amount, wherein each pixel is subject to a total colorant amount limit. In fact, the embodiment described by Borrell et al. implies a linear relationship between input code value and the resulting colorant amount. For example, column 2, lines 53-56 notes that a 0.5 input intensity (i.e., a 50% input code value) maps to a checkerboard pattern where 50% of the pixels will be turned on (i.e., a 50% colorant amount). The nonlinearity that Borrell et al describe results from the fact that the perceived intensity level will generally not vary linearly with colorant amount due to the fact that round dots are printed on a square grid. Applicants fail to see how Borrell et al teaches modifying an input digital image where the input code value

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has a nonlinear relationship to colorant amount, and therefore do not see how Borrell et al disclose or suggest step a in Claim 1.

Furthermore, Borrell et al. is concerned with adding additional colorant in order to increase color saturation, whereas the present invention is concerned with removing ink to satisfy a colorant amount limit. In fact, in column 7, lines 53-55 Borrell et al. explicitly indicate that their patent does not wish to address the problem of ink depletion (i.e, ink reduction). Applicants fail to see how Borrell et al. is relevant with respect to the subject matter of Claim 1 which pertains to a method of reducing colorant amounts subject to a total colorant amount limit.

As has been previously pointed out to the Examiner, Allen et al. do not disclose a method of determining an input colorant amount for each color channel of a pixel wherein the input code value has a nonlinear relationship to the colorant amount as required by the present invention. Applicants have recognized that by using this nonlinear relationship, improved images can be produced. As pointed out on page 6 of the application, an advantage of the present invention is that the maximum amount of colorant is more accurately controlled for a multilevel printer and does not use excess colorants and produces an esthetically pleasing image free from artifacts. Applicants believe they are the first to use this nonlinear relationship in controlling the amount of colorant that is deposited for a pixel. Clearly, there is no motivation in Allen et al. for this claimed subject matter, which is set forth in claim 1. Allen et al. use a linear relationship. Consequently, Applicants fail to see how Allen et al can be combined with Borrell et al to be relevant to the present invention since neither reference makes use of the fact that an input code value has a nonlinear relationship to colorant amount.

It is true, as the Examiner states, that Hudson et al. disclose determining an output code value for each color channel of the pixel responsive to the modified colorant amount and an inverse colorant amount function. However, what Hudson et al. are concerned with is compensating for ink drop volume variations rather than reducing total colorant amount subject to a total colorant amount limit. A particular cartridge may produce an ink drop volume that is larger or smaller than a desired amount. The method of Hudson et al. modifies the code values to compensate for this variation and preserve accurate color.

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Applicants can find nothing in Hudson et al. which relates to the nonlinear relationship between input code value and colorant amount as discussed above, nor to the way that Claim 1 makes use of such a relationship.

In view of the foregoing it is believe that neither Borrell et al., Allen et al., or Hudson et al., taken singly or in combination, disclose or suggest the present invention set forth in Claim 1. Therefore, Claim 1 should be allowable. The remaining claims all depend on Claim 1 and therefore they should be allowed along with it.

Respectfully submitted,



Raymond L. Owens
Attorney for Applicants
Registration No. 22,363

RLO:das
Telephone 585-477-4653
Facsimile 585-477-4646
Enclosures

If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.